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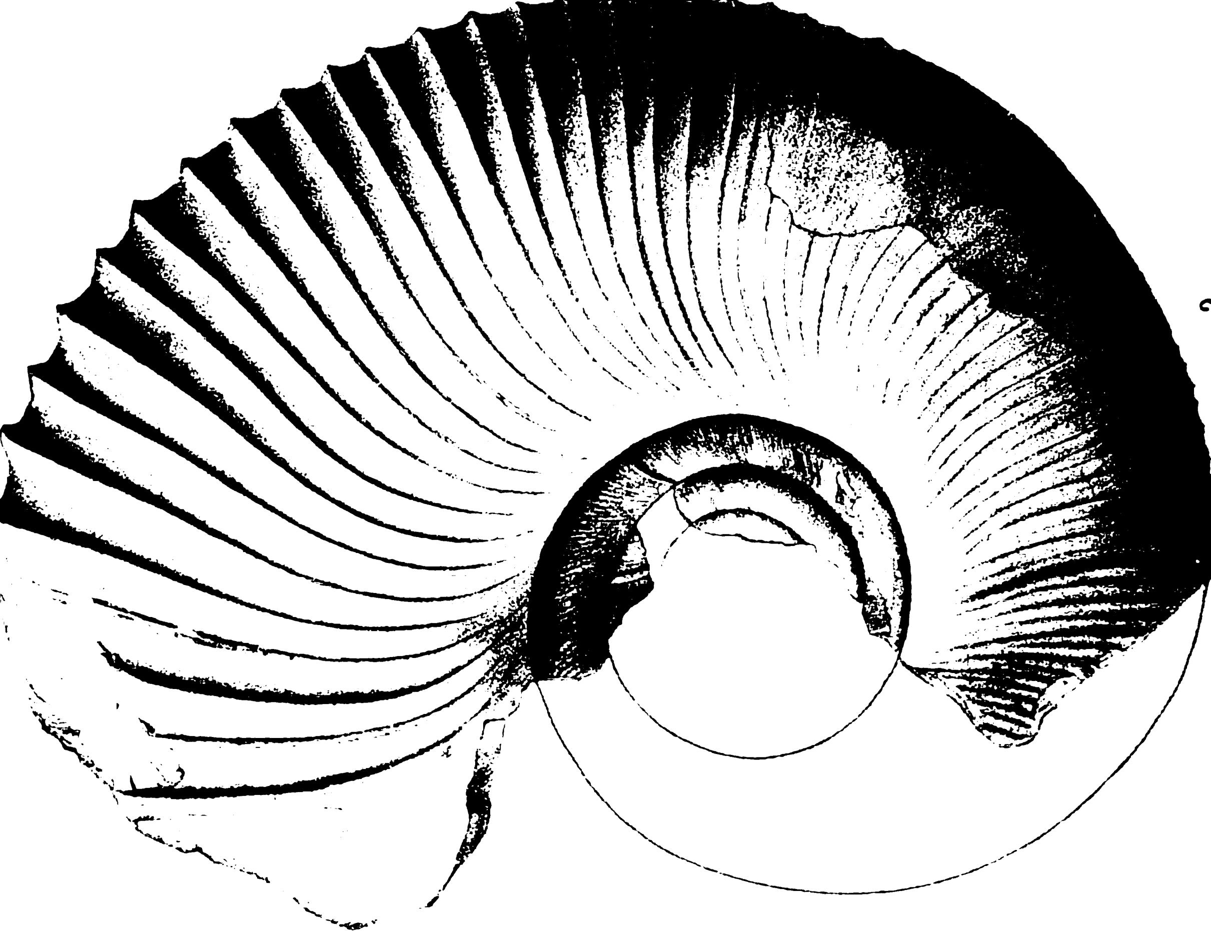

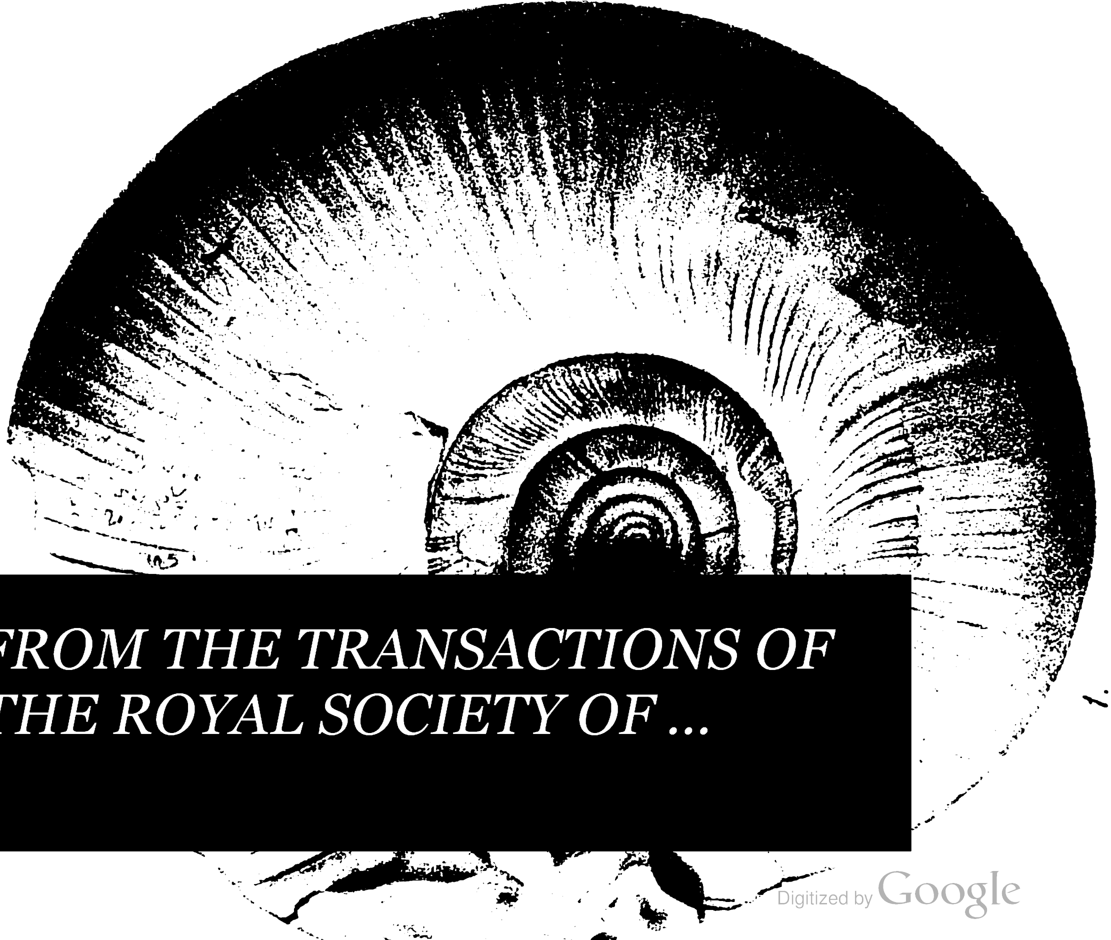

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FROM THE TRANSACTIONS OF THE ROYAL SOCIETY OF CANADA
SECOND SERIES—1895-96
VOLUME I. SECTION IV.
GEOLOGICAL AND BIOLOGICAL SCIENCES

NOTES ON
Some of the Cretaceous Fossils
COLLECTED DURING
Captain Palliser's Explorations in British North America in 1857-1860

ON SOME FOSSILS
FROM THE
Nanaimo Group of the Vancouver Cretaceous

NOTE ON THE
Occurrence of Primnoa Reseda
ON THE
COAST OF BRITISH COLUMBIA

By J. F. WHITEAVES

FOR SALE BY
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1895

OCT 6 1902

III.—*Notes on some of the Cretaceous Fossils collected during Captain Palliser's Explorations in British North America in* 1857-60.

By J. F. WHITEAVES.

(Read May, 1894, but revised to date.)

The present communication is intended as a supplement to a paper published in the eleventh volume of Transactions of this society,[1] in which an attempt was made to give a summary of the present state of our knowledge of the Cretaceous system of Canada, and more especially of that of its fossil flora and fauna.

The Cretaceous fossils collected by Sir James (then Doctor) Hector in Manitoba, the Northwest Territories and British Columbia, during Captain Palliser's explorations, which are of special interest to the student of Canadian geology on account of the early dates at which they were obtained, were referred to in this paper in as much detail as was then practicable, for, at the time when it was written, the writer had never seen any of the specimens themselves. Some of these fossils are still in the Museum of the Geological Society of London, but others have been transferred to the Natural History Department of the British Museum at South Kensington. The whole of those at Burlington House have been kindly forwarded to the writer, for examination and comparison, by the Geological Society, through its president, Dr. Henry Woodward, F.R.S., etc., and it is upon these specimens that the present paper is based, as the rules of the British Museum do not permit of the lending of any of its specimens.

Provisional lists of the fossils collected were contributed by Mr. Robert Etheridge, F.R.S., to Sir James Hector's classical paper "On the Geology of the Country between Lake Superior and the Pacific Ocean," etc., published in the Quarterly Journal of the Geological Society of London for April, 1861, and to Captain Palliser's official report published in 1863.

At the time these lists were prepared, the only illustrated memoirs or papers on the fossils of the Cretaceous rocks of North America that had been published were, Morton's "Synopsis of the Organic Remains of the Cretaceous Group of the United States" (1834), and his descriptions of some new species of organic remains from the same rocks, published in volume viii., part 3 (1842), of the Journal of the Academy of Sciences of Philadelphia, both treating for the most part of fossils from New Jersey; Ferdinand Roemer's "Kreidebildungen von Texas" (1852); D. Dale

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[1] "The Cretaceous System in Canada," Trans. Royal Soc. Canada for 1893, vol. xi., sect. 4, pp. 3-19.

Owen's report of a Geological Survey of Wisconsin, Iowa and Minnesota, etc. (1852); T. Conrad's palæontological supplement to the first volume of Emory's report on the United States and Mexican Boundary Survey (1857); and F. B. Meek's palæontological supplement to Prof. Hind's report on the Assiniboine and Saskatchewan Exploring Expedition (1859).

Mr. Etheridge, naturally and very properly, tried to identify the Cretaceous fossils collected by Sir James Hector, with those species which they most nearly resemble in one or other of these publications. An analysis of his published lists shows that as many as nineteen of these fossils are determined specifically, viz., eleven from Manitoba and the Northwest Territories, and eight additional species from Vancouver Island, but it must also be borne in mind that, of these nineteen, four belong to the genus *Ostrea* and five to *Inoceramus*, both of which are genera in which the species are unusually difficult to discriminate. No less than seven of the species from Manitoba or the Northwest Territories, and seven others from Vancouver Island are referred by Mr. Etheridge to Texan species described and figured by Roemer or Conrad.

The extensive collections made of late years by the officers and employees of the Geological Survey of Canada have, however, conclusively shown that the fossils of the Cretaceous rocks of Manitoba and the Northwest Territories bear a much greater resemblance to those of the Cretaceous rocks of the upper Missouri country as described long ago by Meek and Hayden and more recently illustrated by Meek, than they do to the organic remains of Texas or New Jersey. Several species of fossils, too, from the "Nanaimo group" of the Vancouver Cretaceous have since been described by Meek and other palæontologists, and it has long been known to Canadian geologists that the fauna of this formation is essentially similar to that of the Chico group of the California Cretaceous and by no means so closely analogous to the fauna of the Cretaceous rocks bordering upon the Atlantic or Gulf of Mexico. The fossils collected by Sir James Hector are found to harmonize perfectly with these general conclusions, and in the present state of our knowledge of the fossil fauna of the Canadian Cretaceous it is now feasible to determine the species represented in the collection sent, with a greater degree of accuracy than was possible upwards of thirty years ago.

The specimens which could not be found at Burlington House, and which may have been transferred to the British Museum, and, therefore, could not be forwarded to the writer, are as follows:

All the fossils from Coal Creek (Red Deer River, Alberta), mentioned on page 425 of Sir James Hector's paper, viz.:

Ostrea anomiæformis.
Mytilus (2 species).
Cardium multistriatum,
Crassatella.
Venus.
Rostellaria.
Paludina.

Some of the specimens from the Red Deer River, above the Nick Hills, referred to on page 426 of Sir James Hector's paper as "concretionary masses of limestone, filled with fresh-water shells, such as *Paludina*, *Planorbis*, etc.," and in the first list of specimens on page 244 of Captain Palliser's report as containing shells of "*Paludina*, *Unio*, *Planorbis* and *Cyclas*."[1]

FROM THE ELBOW OF THE SOUTH SASKATCHEWAN.

Astarte Texana, No. 15, and *Cytherea*, No. 16, of the list on page 243 of Captain Palliser's report.

FROM FORKED CREEK AND LONG RIVER, IN THE SOURIS HILLS, MANITOBA.

Leda Hindi, the No. 5 of the list on page 242 of Captain Palliser's report.

FROM VANCOUVER ISLAND.

Inoceramus Texanus, *Inoceramus confertim-annulatus and Ammonites geniculatus*, being Nos. 18, 21 and 28 of the list on page 243 of Captain Palliser's report.

Many of the specimens sent are labelled with two or more numbers, but in the present paper only those will be referred to which obviously correspond to the numbers in the lists of specimens on pages 242-244 of Captain Palliser's report.

It will be convenient to consider these fossils in the following order: A, those from the Laramie formation of Assiniboia and Alberta; B, those from the Pierre-Fox Hills or Montana formation of the Plains; C, those from the disturbed region of the foot-hills and eastern flanks of the Rocky Mountains; and, D, those from the "Nanaimo group" of Vancouver Island.

A.—*From the Laramie of Assiniboia and Alberta.*

OSTREA GLABRA, Meek and Hayden, varieties.

Ostrea glabra, Meek and Hayden. 1857. Proc. Ac. Nat. Sc. Philad., vol. ix., p. 146.
Ostrea cortex, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. London, vol. xvii., pp. 418-419, but probably not *O. cortex*, Conrad, 1857.
Ostrea Veleniana, Etheridge. 1863. In Capt. Palliser's Off. Rep., p. 242, No. 2, but not *O. Veleniana*, Conrad, 1857.
Ostrea cortex, Etheridge. 1863. *Ib.*, p. 243, Nos. 119, and 30.
Ostrea Wyomingensis, Meek. 1873. Rep. U. S. Geol. Surv. Terr. for 1872, and illustrated by Dr. C. A. White in 1880, on pl. 20 of U. S. Geol. Surv. Terr., Contr. to Pal., Nos. 2-8.

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[1] Two small pieces of limestone were sent from this locality. One of these contains a few specimens of a shell which appears to be *Campeloma productum*, White, and the other, two badly preserved casts of the interior of a species of *Viviparus*.

Ostrea glabra, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 521, pl. 40, figs. 6, *a-c*.

" " White. 1883. Rev. Non-Marine Foss. Mollusc. North America, pls. 9, 10 and 11.

West flank of Cypress Mountain (Assiniboia), July, 1859: three specimens of the thin-shelled, comparatively smooth, typical form of *O. glabra*, with small ligamentary area, and labelled No. 2, *Ostrea Veleniana*.

"Red Deer River" (Alberta), "southwest of the Hand Hills, and over the Lignite, Dr. Hector, June, 1859": four specimens of the variety *Wyomingensis*, labelled No. 30, *Ostrea cortex*, two with high ligamentary areas.

Battle River (Alberta), above the Elbow, July, 1858: two specimens (one labelled *O. cortex*) with a very high ligamentary area, and certainly very closely resembling *O. cortex*, Conrad.

CORBICULA OCCIDENTALIS, Meek and Hayden.

Cyrena occidentalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.

Cardium multistriatum, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xviii., p. 425, but not *C. multistriatum*, Schumacher.

" " Etheridge. 1863. No. 35 of the list on p. 243 of Capt. Palliser's Report.

Corbicula occidentalis, Meek. 1869. Proc. Ac. Nat. Sc. Philad., vol. xii., p. 432.

" " G. M. Dawson. 1875. Rep. Geol. & Resourc. Reg. in vic. of 40th Par., p. 133.

" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 521, pl. 40, figs. 6, *a-c*.

" " White. 1880. U. S. Geol. Surv., Contr. to Pal., Nos. 2-8, p. 75, pl. 21, figs. 3, *a-c*.

" " White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 31, pl. 17, figs. 6, 7, and pl. 23, figs. 1-6.

" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 7, pl. 1, figs. 3 and 3 *a*.

"Red Deer River, southwest of the Hand Hills and over the Lignite, Dr. Hector, June, 1859": a small piece of argillaceous limestone, with an imperfect cast of the interior of a right valve of this species, two valves of *Corbula subtrigonalis* and a few characteristic examples of its variety *perundata*. The specimen is labelled "*Cardium multistriatum*, Schum., and *Venus*," but without number, though it probably corresponds to Nos. 35, 36 and 37 of the list of specimens on page 243 of Captain Palliser's report.

CORBULA SUBTRIGONALIS, Meek and Hayden.

Corbula subtrigonalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 529, pl. 40, figs. 3, *a-b*.
" " White. 1880. U.S. Geol. Surv., Contr. to Pal., Nos. 2-8, p. 80.
" " White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 36, pl. 19, figs. 10-15.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i, pt. 1, p. 62.

On the same small piece of rock as the preceding species: one full-sized right valve and a small left valve.

CORBULA SUBTRIGONALIS, var. PERUNDATA.

Corbula perundata, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 116.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 530, pl. 40, figs. 4, *a-d*.
Corbula subtrigonalis, var. *perundata*, White. 1883. Rev. Non-Marine Foss. Moll. N. Amer., p. 36, pl. 19, figs. 16 and 17.
Corbula perundata, Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 69.

With the two preceding species. This shell could very well be No. 36 of the list on page 243 of Captain Palliser's report, as it has much the aspect of a small *Crassatella*. A small *Corbula* from the Laramie of Wyoming, which Dr. C. A. White regards as one of the forms of *C. subtrigonalis*, has indeed been called *C. crassatelliformis* by Meek.

B.—*From the Pierre-Fox Hills or Montana formation of the Plains.*

PECTEN, OR SPONDYLUS, Sp.

Ostrea lugubris, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 415, but apparently not *O. lugubris*, Conrad, 1857.
" " Etheridge. 1863. No. 8 of the list on page 242 of Capt. Palliser's report.

A specimen labelled "No. 8, Cretaceous shale of Long River and Forked Creek, Souris Hills" (Manitoba), "*Ostrea lugubris*, Dr. Hector, 1857," is a cast of the interior of one valve of a small bivalve, a little more than three millimetres in height, and slightly less than that in length. It is moderately convex, symmetrical, and nearly circular in outline, with a flattened central beak, which is sharply angulated on both sides, and a surface marked with radiating ribs of unequal size. It is scarcely possible to determine to what genus this specimen should be referred, but it gives one the impression of being, perhaps, the cast of a valve of a very young shell of a species of *Pecten* or *Spondylus*, rather than that of a young *Ostrea* or *Anomia*.

PTERIA LINGUIFORMIS, Evans and Shumard.

Avicula linguiformis, **Evans and Shumard, 1854. Proc. Ac. Nat. Sc. Philad., vol. ii., p. 163.**
" " **Meek. 1859. In Hind's Rep. Assinib. and Saskatch. Expl. Expd., Toronto, p. 183, pl. 1, fig. 6.**
Pteria linguiformis, **Meek, 1876. Rep. U.S. Geol. Surv. Terr., vol. ix., p. 32, pl. 16, figs. 1, *a-d*.**
" " **Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 31.**

"Battle River" (Alberta), "near the Elbow," July, 1858 : two good specimens of the left valve of shells of this species. These are both labelled "*Avicula*," but without number, and are evidently the specimens referred to under that name on page 419 of Sir James Hector's paper in the seventeenth volume of Proceedings of the Geological Society of London. It is possible also that they may be the specimens from "Bath" (a typographical error for Battle) "River, near the Elbow," referred to on page 243 of Captain Palliser's official report as "No. 101, *Auricula rubrascensis*," an obvious misprint for *Avicula* (now called *Pteria*) *Nebrascensis*, as neither it nor *P. linguiformis* had then been figured.

INOCERAMUS CRIPPSII ? var. BARABINI.

Inoceramus cuneatus, **Meek and Hayden. 1860. Proc. Ac. Nat. Sc. Philad., vol. vii., p. 181.**
Inoceramus Crippsii ? **var.** *Barabini*, **Meek. 1876. Rep. U.S. Geol. Surv. Terr., vol. ix., p. 49, pl. 12, fig. 3, and pl. 13, figs. 1, *a-c*.**
Inoceramus Barabini, **Whitfield. 1877. Pal. Black Hills, Dakota, p. 398, pl. 7, fig. 7, and pl. 9, fig. 8.**
" " **Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 33.**

"Elbow of South Saskatchewan," Assiniboia, September 20th to 30th, 1857 : three small and very imperfect specimens, the largest about three-quarters of an inch in length and not quite half an inch in maximum height, one labelled "No. 13, *Cardium*," and the other two "No. 14, *Exogyra*," which are somewhat doubtfully referred to this supposed variety of *I. Crippsii*. Two adult and much more perfect examples of a shell, which seem to the writer to agree very well with Meek's description and figures of the western form which he calls *I. Crippsii* var. *Barabini*, were collected by Professor Macoun at the Elbow of the South Saskatchewan in 1879.

NUCULA. (Species undeterminable.)

"Battle River," near the Elbow, July, 1858 : a cast of the interior of a right valve, on a small piece of rock, associated with one example of *Protocardia subquadrata*, and an imperfect valve of a concentrically ribbed *Mactra* or *Callista*.

The specimen is labelled "*Cytherea*," but without number, and may correspond to Nos. 118, "*Cardium;*" 112, "*Venus* (*Cytherea ?*);" and 108, "*Nucula*,"—of the list on page 243 of Captain Palliser's report.

LUCINA OCCIDENTALIS, Morton. (Sp.)

Tellina occidentalis, Morton. 1842. Jour. Ac. Nat. Sc. Philad., vol. viii., p. 210, pl. 11, fig. 3.
Lucina occidentalis, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 272.
" " Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 134, pl. 17, figs. 4, *a-d*.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 39.

Elbow of the South Saskatchewan, September, 1857: a very imperfect specimen, but with a large portion of the thick test preserved on each valve, so that the outline of the shell can be inferred from the lines of growth. In addition to the locality, the specimen is labelled "No. 12, *Pholadomya occidentalis*, Morton," probably by mistake, as it is clearly not a *Pholadomya*, nor even at all closely related to that genus.

CYPRINA OVATA, Meek and Hayden.

Cyprina ovata, Meek and Hayden. 1857. Proc. Ac. Nat. Sc. Philad., vol. ix., p. 144.
Cytherea Texana, Etheridge. 1861. In Hector's paper, Quart. Journ. Geol. Soc. Lond., vol. xxii., p. 424, but not *C. Texana*, Conrad, 1857.
" " Etheridge. 1863. No. 33 of the list of specimens on page 243 Captain Palliser's Off. Report.
Cyprina ovata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 149, fig. 8, and pl. 29, figs. 7, *-a-c*.
" " Whiteaves. 1885. Contr. to Canad. Palæont., vol. 1, pt. 1, p. 40.

Red Deer River, southwest of the Hand Hills, Dr. Hector, June, 1859: three characteristic specimens, labelled "No. 33, Red Deer River—Hand Hills (over the Lignite), Dr. Hector, 1859."

PROTOCARDIA SUBQUADRATA, Evans and Shumard. (Sp.)

Cardium subquadratum, Evans and Shumard. 1857. Trans. Ac. Nat. Sc. St. Louis, vol. i., p. 39.
Protocardia (Leptocardia) subquadrata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 175, pl. 29, figs. 8, *a-e*.
Protocardia subquadrata, Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1, p. 41, pl. 5, figs. 4 and 4 *a*.

Battle River, near the Elbow, July, 1858: a single specimen, with both valves preserved, on the same piece of rock as the "*Nucula*" referred to on the preceding page.

LIOPISTHA UNDATA, Meek and Hayden.

Pholadomga undata, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philadelphia, vol. viii., p. 81.
Liopistha (Cymella) undata, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 236, pl. 39, figs. 1, *a-b*.
" " " Whiteaves. 1885. Contr. to Canad. Palæont., vol. i., pt. 1. p. 43, and pt. 2, p. 178.

A small piece of an ironstone concretion in the collection has a nearly perfect and well-preserved example of *Liopistha undata*, with the valves spread out, on one side, and a fragment of *Baculites compressus* on the other. The specimen is not numbered, but labelled, "*Baculites compressus*, Red Deer River and Battle River, at the Elbow." It is probably the "Baculites" from the Battle River locality referred to as No. 112 in the list of specimens on page 243 of Captain Palliser's report, as the name of that genus is not included in the list of specimens from the Red Deer River, on the same page.

CINULIA CONCINNA, Hall and Meek.

Actæon concinnus, Hall and Meek. 1854. Mem. Ac. Arts & Sc., Boston, vol., v. n. ser., p. 390, pl. 3, fig. 4.
Avellana subglobosa, Meek and Hayden. 1856. Proc. Ac. Nat. Sc. Philad., vol. viii., p. 64.
Avellana concinna, Meek. 1859. Hind's Rep. Saskatch. and Assinib. Expl. Expd., Toronto, p. 184.
Cinulia concinna, Meek and Hayden. 1860. Proc. Ac. Nat. Sc. Philad., vol. xii., p. 425.
Cinulia (Oligoptycha) concinna, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 284, pl. 31, figs. 6 *bis*, *a*, *b*, *c*.
Cinulia concinna, Whiteaves. 1885. Contr. to Canad. Pal., vol. i., pt. 1, p. 46.

"Elbow of the South Saskatchewan," Assiniboia, September, 1857: a mould of the exterior of a shell of this species in a small piece of indurated clay. In addition to the locality quoted, the specimen is labelled "No. 13," which number refers to a specimen designated as "Cardium? sp.," in the list on page 242 of Captain Palliser's report. Besides the *Cinulia*, however, the only fossils apparent on this piece of argillaceous rock are a fragment of an *Anisomyon*, and an imperfect right valve of a very small *Inoceramus*, apparently a young shell of the western *Inoceramus*, usually referred to *I. Crippsii*, var. *Barabini*. *Cinulia concinna* has since been collected, in good condition, at the Elbow of the South Saskatchewan by Professor Macoun in 1879.

LUNATIA CONCINNA? Hall and Meek.

Natica concinna, Hall and Meek. 1856. Mem. Am. Ac. Arts and Sc., Boston, vol. v., p. 384, p. 3, figs. 2, *a-d*.
Natica Moreauensis, Meek and Hayden. 1856. Trans. Ac. Nat. Sc. Phil., vol. viii., pp. 64 and 382.

Natica (Lunatia) Moreauensis, Meek and Hayden. 1860. *Ibid.*, vol. xii., p. 422.
Lunatia concinna, Meek. 1876. Rep. U. S. Geol. Surv. Terr., vol. ix., p. 341, pl. 32, figs. 11 *a*, *b*, *c*.
" " Whiteaves. 1885. Contr. to Canad. Pal., vol. 1, pt. 1, p. 48.

"Red Deer River, southwest of the Hand Hills, Dr. Hector, June, 1859": eleven specimens, each numbered 38, and evidently corresponding to that number on page 243 of Captain Palliser's report. The specimens are either mere casts of the interior of the shell, or casts with part of the exfoliated test adherent thereto, so that their identity with *L. concinna* is not quite certain, though it is highly probable.

BACULITES COMPRESSUS, Say.

Baculites compressus, Say. 1821. Am. Journ. Sc. and Arts, vol. ii., p. 41; also of subsequent writers in the United States and Canada.
" " Etheridge. 1861. In Hector's paper, Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 415.
" " Etheridge. 1863. No. 10 of the list on p. 242 of Capt. Palliser's Rep.

Twenty-three specimens of *Baculites* in the collection, most of them mere fragments, are labelled "No. 10, *Baculites compressus*, Elbow of S. Saskatchewan." Nineteen of these are fairly typical *B. compressus*, but three fragments appear to the writer to be probably referable to *B. ovatus*, though they are too waterworn to be identified with much certainty. One specimen, a piece of a body-chamber nearly four inches long, labelled on one side, "Elbow of S. Saskatchewan," and on the other, "Picked up in the bed of the river above Fort Pitt," seems to be intermediate in its characters between *B. compressus* and *B. ovatus*.

Battle River, at the Elbow, the fragment referred to under the heading *Liopistha undata*.

BACULITES OVATUS, Say.

Baculites ovatus, Say. 1821. Am. Journ. Sc. and Arts, vol. ii., p. 41; and of subsequent American authors.

Elbow of South Saskatchewan, the three fragments referred to in the remarks upon the preceding species. One of the three is labelled also, "Fort Pitt, from bed of river."

In addition to these species, there are in the collection three specimens of fossiliferous Cretaceous shale from Long River and Forked Creek, in the Souris Hills, Manitoba, two labelled No. 6, and one No. 7. As indicated by Mr. Etheridge, there are "scales of ctenoid fishes" upon both specimens labelled No. 6, and a fragment of an "annelid tube" upon the specimen labelled No. 7.

C.—*From the Cretaceous rocks of the disturbed region of the Foot-Hills and eastern flanks of the Rocky Mountains.*

OSTREA.

Six specimens of the "Ostrea shales" from Bighorn Creek, on the North Saskatchewan, between the Foot-Hills and the Rocky Mountains, collected by Sir James Hector in September, 1858, have their surfaces sparingly strewn with valves of a small *Ostrea*, but only one of these valves is sufficiently perfect and well preserved to show its characters at all clearly. It is a lower valve, a little more than half an inch in its maximum diameter, with only the inner surface exposed, the exterior of its test being completely buried in the matrix. This valve is similar in size and outline to some of the specimens of *O. congesta* (Conrad) figured by Meek on plate 9 of the ninth volume of Reports of the United States Geological Survey of the Territories, but it shows no trace of attachment on its under surface. These pieces of *Ostrea* shale are evidently those referred to on page 243 of Capt. Palliser's report, in the first entry under the heading "Incertæ sedis."

CARDIUM.

Six specimens in the collection, labelled "Cardium shales, Old Bow Fort," contain numerous imperfect casts of the interior and moulds of the exterior of the shell of a small species of *Cardium*, whose specific relations are uncertain. All that these casts or moulds show is that the shell is rather strongly convex, obliquely subovate in outline, and that its whole surface is marked with somewhat coarse radiating ribs. None are sufficiently perfect to admit of a satisfactory comparison between them and such forms as the *Cardium* (*Criocardium*) *speciosum* of Meek and Hayden, from the Fox Hills group of Montana and Colorado, and the *Cardium Kansaense* of Meek, from the Dakota group of Kansas.

Old Bow Fort is on the Bow River, in the Foot-hills of Alberta, and the six specimens now under consideration were collected in 1858, and correspond to the first entry in the list of specimens on page 244 of Capt. Palliser's report. They are also the specimens referred to on page 242 of that report as "nodules of ironstone from septaria clays occurring on Bow River, ten miles below the Old Fort." They contain obscure Cretaceous fossils.

D.—*From the Nanaimo group of Vancouver Island.*

OSTREA OR SPONDYLUS. (Species undeterminable.)

***Ostrea bella*, Etheridge. 1863. No. 44 of the list of specimens on p. 242 of Capt. Palliser's Rep., but probably not *O. bella*, Conrad, 1857.**

A small piece of glauconitic rock labelled "No. 48 (below the Lignite), Departure Bay, Nanaimo; *Ostrea bella*, Conrad; Dr. Hector, 1860;

coll., Mr. Mackay,"—contains a few valves or fragments of valves of a species of *Ostrea*, and a single valve of a shell whose generic and specific relations are uncertain. This valve is sixteen lines and a-half in length and about fourteen and a-half in breadth. It is moderately convex, but with a rather broad, shallow, transverse constriction a little in front of the mid-length, obliquely subovate in outline, a little longer than broad, and the extremely thin test is marked with fine radiating raised lines, about three in the breadth of a millimetre, which are minutely bifurcating anteriorly, when viewed with a lens. It is much more finely ribbed than the convex valve of *Ostrea bella*, if Conrad's figures are correct, and indeed its surface markings are not at all like those of an *Ostrea*. A fragment of a much larger specimen in the collection, from the same locality and apparently belonging to the same species, has essentially the same sculpure on the *interior* of the shell as the *Spondylus complanatus* of D'Orbigny,[1] from the French Neocomien. Another specimen in the collection, from the same locality and possibly also belonging to the same species, is the No. 41 of the list of specimens on page 243 of Capt. Palliser's report. It is a rough cast of the interior of one valve, about two inches and a-quarter in length and an inch and a-half in its greatest breadth. It is longitudinally subovate, but rather irregular in outline, its umbonal region is prominent, and its surface shows impressions of somewhat narrow, flexous, radiating ribs.

INOCERAMUS VANCOUVERENSIS, Shumard.

Inoceramus Vancouverensis, Shumard. 1858. Trans. Ac. Sc. St. Louis, vol. i., p. 123.
Inoceramus unduloplicatus, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. Lond., vol. xvii., p. 434, but not *I. undulato-plicatus*, Roemer, 1852.
Inoceramus mytiloides, Etheridge. 1861. *Ib.*, p. 34, but not *I. mytiloides*, Mantell, 1852.
Inoceramus Vancouverensis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 170, pl. 20, figs. 4, 4 *a* and *b*.
Inoceramus Nebrascensis. var. *Sagensis*, Whiteaves. 1879. *Ib.*, p. 172. (A typ. err. for *I. Sagensis*, var. *Nebrascensis*.)

It is notoriously difficult to differentiate species in the genus *Inoceramus*, partly because the specimens usually obtained are so imperfect or badly preserved, and partly because they are so variable in form and sculpture. No less than seven species have been identified or described by different writers as occurring in the Cretaceous rocks of Vancouver and the adjacent islands, viz., *I. Vancouverensis*, Shumard, *I. subundatus*, Meek, and the forms referred by Etheridge to *I. Crippsii* of Roemer and Conrad, *I. Texanus*, Conrad, *I. Nebrascensis*, Owen, *I. undulato-plicatus*, Roemer, and *I. mytiloides*, Roemer. This number is probably too large, but it would seem that Dr. C. A. White goes to the opposite extreme when he maintains that there are only two species in the Nanaimo group, viz., the form with divaricating plications which the writer formerly referred to *I. undulato-plicatus*, and *I. Vancouverensis*. Thus, the species last named appears to be sufficiently distinct from *I. subundatus*, though the latter may be only a variety of the *I. Crippsii* of European authors, as suggested by Meek.

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[1] Paléontologie Française, Terr. Crét., vol. iii., p. 657, pl. 451, figs. 7-10.

In the collection now under consideration there are three specimens which are apparently referable to *I. Vancouverensis*. One of these is a very imperfect left valve labelled "No. 20, *Inoceramus undulato-plicatus*, septarian clay (above lignite), Nanaimo River, Dr. Hector, 1860." The umbo of this valve is not so tumid as is usual in this species, and the surface markings consist of low, distant, concentric undulations, but there are no indications of any radiating and divaricating folds. The other two are very small right valves from essentially the same locality, one labelled "No. 22, *Inoceramus mytilopsis*," and the other "*Isocardium*." Both have the prominent umbo characteristic of *I. Vancouverensis*, and the latter evidently corresponds to the latter part of the entry, "Also *Nautilus* and *Incardium*" (a typographical error for *Isocardium*), after No. 29 in the list of specimens on page 243 of Captain Palliser's report.

The right valve from the Sucia Islands referred to *I. Sagensis*, var. *Nebrascensis*, on page 172 of the second part of the first volume of "Mesozoic Fossils," is a broad variety of *I. Vancouverensis*.

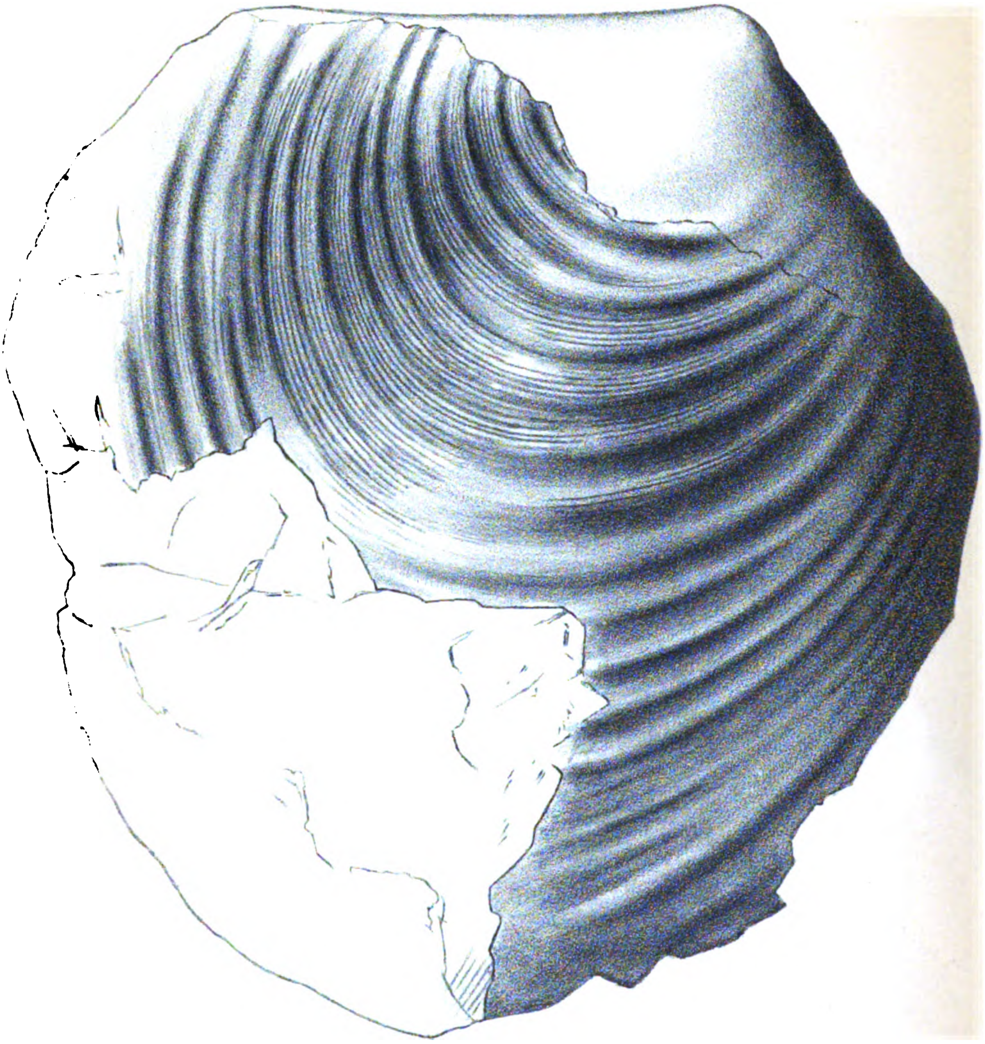
INOCERAMUS SUBUNDATUS, Meek.

Inoceramus subundatus, Meek. 1861. Proc. Ac. Nat. Sc. Philad., vol. xiii., p. 315.
Inoceramus Whitneyi, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii.. p. 193, pl. 32, fig. 91.
Inoceramus Crippsii? var. *subundatus*, Meek. 1876. Bull. Geol. and Geogr. Surv. Terr., vol. ii., No. 4, p. 358, pl. 3, figs 1, 1*a*, and 3, 3*a*.
Inoceramus Crippsii, var. *proximus*, Whiteaves. 1879. Geol. Surv. Canada, Mesoz., Foss., vol. i., pt. 2, p. 172.
" " var. *Suciensis*, Whiteaves. 1879. *Ib.*, p. 173.
" " var. *Barabini*, Whiteaves. 1879. *Ib.*, p. 173.

Four small slabs of argillaceous shale from the "Nanaimo River," four labelled "Stewart's Bank," and one "Fossil or Pemberton Bank," have upon one or both sides numerous small valves, which correspond very well with Meek's illustrations of *I. subundatus*. These valves are all obliquely subovate in outline and a little longer than high. Their beaks are very small and scarcely project above the hinge-line. The maximum length of the largest of these valves is very little more than an inch.

PALLISER'S CRETACEOUS FOSSILS.

Trans R. S. C., 1895. Sec. IV., Plate I.



Two-thirds nat. size.

To Illustrate Mr. Whiteaves's Paper.

L. M. LAMBE, F.G.S., DEL O. E. PRUD'HOMME, LITH

INOCERAMUS. (Species uncertain.)

Plate I.

In addition to the foregoing, there are in the collection four specimens which the writer is unable to identify, but which are probably referable to one species of *Inoceramus*. All four are very imperfect, but the least so is a specimen about eight inches in its maximum height and not quite seven in length, labelled "No. 19, *Inoceramus Nebrascensis*, Comox, Vancouver's Island, and Nanaimo River, Dr. Hector, collected by Mr. Mackay." This specimen, which is represented two-thirds the natural size on Plate I., is compressed convex, and quite as much compressed proportionately upon the umbones as upon any other part of the shell. Its anterior side is very short and comparatively narrow. Its posterior side, which is much expanded vertically, both above and below, is highest behind the midlength, and subtruncated above. Its hinge-line is rather long, and its sculpture consists of low but distinct and regularly arranged concentric undulations or plications, and close-set and nearly equidistant incremental striæ. Most of the nacreous layer of the test is preserved on the right valve of this specimen, but on and around the umbo and beak the whole of the test is worn away. In the part upon which the test is preserved, about twenty concentric undulations can be counted. The general outline of this specimen is not very unlike that of three very large examples of *Inoceramus Sagensis*, var. *Nebrascensis*, from the South Saskatchewan River, opposite Swift Current Creek, in the Museum of the Geological Survey of Canada, but in each of these the umbones are very tumid and the concentric undulations distant, irregularly disposed and almost obsolete.

Two other specimens from the same locality are labelled "*Inoceramus Crippsii*," and the more perfect of these is the No. 17 of the list of specimens on page 242 of Capt. Palliser's report. It is a large and well-preserved left valve, with about one-third broken off at the posterior end. It has much the same shape and style of sculpture as the specimen labelled *Inoceramus Nebrascensis*, but the concentric plications of the former (which are twenty-eight in number) are more prominent and acute in the umbonal region, where they are crossed by numerous fine radiating linear ridges. The fourth specimen is very imperfect, and its surface markings are almost obliterated by weathering.

ARCA VANCOUVERENSIS, Meek.

Arca Vancouverensis, **Meek. 1857. Trans. Albany Inst., vol. iv., p. 40.**
Grammatodon ? Vancouverensis, **Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., No. 4, p. 356, pl. 3, figs. 5 and 5a.**

One small but characteristic example, thirteen millimetres and a-half, or a little more than half an inch, in maximum length, labelled "No. 43, *Arca* (below the Lignite), Departure Bay, Nanaimo, Dr. Hector, 1860; coll. by Mr. Mackay." A specimen from the same locality, labelled No. 45, is a cast of the interior of both valves of a shell which may be referable to this species, but which has unusually tumid or ventricose umbones. A second specimen from the same locality (the No. 47 of the list of specimens on page 243 of Capt. Palliser's report), although labelled "*Exogyra?* sp.," seems to the writer to be a distorted left valve of a shell which is essentially the same as the specimen labelled No. 45. A third specimen is a coarse cast of a left valve of a species of *Arca*, which is too imperfect for identification.

In the above synonymy the name "*Nemodon Vancouverensis*" (nobis) is omitted, as the writer is not satisfied that the large shells referred to on page 163 and figured on plate 19 of the second part of the first volume of "Mesozoic Fossils," are the adult state of *A. Vancouverensis*, as was then supposed.

TRIGONIA EVANSANA, Meek.

Trigonia Evansana, Meek. 1857. Trans. Albany Inst., vol. iv., p. 42.
Trigonia Emoryi, Etheridge. 1861. In Hector's paper, Quart. Jour. Geol. Soc. Lond., vol. xvii., p. 432, but not *T. Emoryi*, Conrad, 1857.
" " Etheridge, 1863. No. 40 of the list of specimens on p. 243 of Capt. Palliser's report.
Trigonia Evansii, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 189, pl. 25, fig. 17.
Trigonia Evansi, Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 359, pl. 2, figs. 7, 7*a* and 7 *b*.
Trigonia Evansana, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 161.

Ten specimens, mostly mere casts of the interior of single valves, each labelled "No. 40, *Trigonia Emoryi*, Conrad; below the lignite, Departure Bay, Nanaimo, Dr. Hector, 1860; collected by Mr. Mackay."

In 1876 (*op. cit.*, p. 360) Mr. Meek pointed out that his *T. Evansii* "is almost certainly the same shell that was referred by Mr. Etheridge, among Mr. Hector's collections from Nanaimo, to *T. Emoryi*, Conrad (pl. iii., fig. 2 *a*, *b*, *c*, United States and Mexico Boundary Survey Report)." "It is, however," he says, "certainly very distinct from that species, not only in form and in its decidedly less crenate costæ, but more particularly in having a smooth, longitudinally sulcate, depressed ridge on each side of its escutcheon, not crossed by the costæ. Its costæ are likewise less numerous and more prominent."

CYTHEREA NITIDA, Gabb. (Sp.)

Cytherea Leonensis, Etheridge. 1861. In Hector's paper in the Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 432, but not *C. Leonensis*, Conrad, 1859.
Cytherea Conensis (err. typ. for *Leonensis*), Etheridge. 1863. No. 42 of the list of specimens on p. 243 of Capt. Palliser's report.

Venus (Mercenaria ?) varians, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 161, pl. 23, figs. 140, 140*a* and 141.
Meretrix nitida, Gabb. 1864. *Ib.*, p. 165, pl. 23, fig. 147.
Caryatis nitida, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., pp. 186 and 240.
Chione varians, Gabb. 1869. *Ib.*, p. 239.
Cytherea (Caryatis) plana, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss. vol. i., pt. 2, pl. 17, figs. 14, 14 *a*, *b*, but probably not *Venus planus*, Sowerby, 1812.

Ten rough casts of the interior of single valves of this species, each labelled "No. 42, *Cytherea Leonensis* (below the lignite), Departure Bay, Nanaimo, Dr. Hector, 1860, collected by Mr. Mackay." Some of them are much distorted, and none of them show the imprint or impress of the pallial line. They correspond to the typical form of *Chione varians*, in which the length of the valves is greater than their height.

Mr. Gabb admits that "there is a great resemblance" . . . "in general shape" between his *Caryatis nitida* and *Chione varians*, but claims that the former can at once be distinguished from the latter by its "smaller size, polished surface, fewer and less distinct lines of growth, and the presence of the deeply impressed lunule." A comparison of a number of specimens of both these forms from the Chico group at several localities in California, kindly forwarded by Mr. T. Stanton, and from the Nanaimo group of Vancouver and the adjacent islands, has convinced the writer that these characters are inconstant and altogether insufficient to warrant their specific separation, and Mr. Stanton writes that he had previously come to the same conclusion.

The specific term *nitida* is here used in preference to *varians*, as the latter name is preoccupied by a recent shell, the *Cytherea varians* of Hanley, the *Caryatis varians* of the catalogue of the shell collection of F. Paetel.

THRACIA (?) SUBTRUNCATA, Meek.

Thracia (?) subtruncata, Meek. 1857. Trans. Albany Inst., vol. iv., p. 44.
" " Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 363, pl. 2, figs. 4 and 4 *a*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss. vol. i., pt. 2, p. 140, pl. 17, fig. 7.

Three imperfect and badly preserved specimens, each labelled "No. 46, ***Psammobia* (?)**, sp., below the lignite, Departure Bay, Nanaimo, Dr. Hector, 1860, collected by Mr. Mackay," are doubtfully referred to this species.

NAUTILUS. (Species indeterminable.)

A single crushed and distorted specimen, not quite three inches in its maximum diameter, is labelled "Nautilus, Stewart's Bank, Nanaimo River." Its siphuncle is nowhere visible, but a large piece of the test is preserved on one side, near the aperture. The surface is almost smooth and marked only with fine transverse striæ of growth, while the umbilicus is nearly if not quite closed.

So far, only two species of *Nautilus* have been described from the Vancouver Cretaceous, viz., *N. Campbelli*, Meek, and *N. Suciensis*, mihi. The character mainly relied upon for the separation of these two forms is the different position of the siphuncle in each, for the surface markings of *N. Campbelli* are still unknown, and *N. Suciensis*, although transversely ribbed in the adult state, is almost smooth when half-grown.

BACULITES CHICOENSIS, Trask.

Baculites Chicoensis, Trask. 1856. Proc. Calif. Acad. Nat. Sc., p. 85, pl. 2, fig. 2.
Baculites compressus, Etheridge (Pars.). 1861 (April). In Sir James Hector's paper in Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 434.
Baculites inornatus, Meek. 1891 (October). Proc. Ac. Nat. Sc. Philad., vol. xii., p. 316.
Baculites compressus, Etheridge. 1863. No. 25 of the list of specimens on p. 243 of Capt. Palliser's report.
Baculites Chicoensis, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 80, pl. 14, figs. 27, 29 and 29*a*, and pl. 17, figs. 27 and 27*a*.
" " Meek. 1876. Bull. U. S. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 364, pl. 4, figs. 2 and 2 *a-c*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 144.
" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 47.

In the collection there are fourteen specimens of *Baculites*, varying from rather more than an inch to a little over five inches in length. Some of these are labelled "Pemberton's Bank, Nanaimo River," and others "Stewart's Bank, Comox Island, twenty-one miles northwest of Nanaimo." They correspond to the "*Baculites compressus* and two other species" of the list of fossils on page 434 of Sir James Hector's paper, and to Nos. 23, 24 and 25 of the list on page 243 of Captain Palliser's report. One specimen, labelled No. 24, is subovate or elliptically subovate in cross-section, and therefore probably referable to the typical form of *B. Chicoensis*, though its dorso-ventral diameter it so much greater than its maximum breadth that it seems to the writer, as it did to Mr. Etheridge, to be more nearly related to Say's *B. compressus* than to his *B. ovatus*. Four or five are trigonal in outline in cross-section, and correspond to the form for which Meek proposed the name *B. occidentalis*, but most of the specimens are intermediate in character between the typical form and this variety, and in all the dorso-ventral diameter, near the larger end, is much greater than the maximum breadth.

PACHYDISCUS. (Species uncertain.)

There are only three specimens of *Ammonites* in the collection received, and each of these is very imperfect. The most perfect is a specimen about six inches and a half in its maximum diameter, labelled "*Ammonites*, Pemberton's Bank" (Nanaimo River). It is septate throughout, but so much of the outer volution is worn away that its original shape is completely destroyed, though the inner volutions are well preserved, and judging by these, the species would seem to be referable to Zittel's genus *Pachydiscus*. It resembles the *Ammonites Newberryanus* of Meek very closely in shape, but differs therefrom in its much fainter, almost obsolete and more distant transverse ribs; also in the absence of the periodic constrictions so characteristic of *A. Newberryanus*. It is, apparently, a much flatter shell than the *Ammonites Suciensis* of Meek (which is clearly a *Pachydiscus*), and has a sutural line more like that of *A. Newberryanus*. Another specimen, labelled "No. 26," is a fragment of the earlier whorls of a round-backed *Ammonite* about an inch in its greatest diameter; and the third, labelled "*Ammonites*, Comox Island," is a rather large but quite worthless waterworn fragment.

Since the foregoing part of this communication was written, the writer has received from Dr. Franz Kossmat a separate copy of his interesting paper "On the importance of the Cretaceous rocks of Southern India in estimating the geographical conditions during later Cretaceous times," published in a recent number of the Journal of the Royal Geological Institute of Vienna.[1] In this paper Dr. Kossmat says that he saw in an old and still unstudied collection of Hector's, in the British Museum, a beautiful specimen of *Ammonites Indra*, Forbes, the typical *Pachydiscus Otacoodensis* (new to North America) of the Arrialoor group, besides others, some of them new species of *Pachydiscus*, and *Baculites occidentalis*, Meek, which is very similar to the Indian *B. vagina*, all from rocks of the age of the Chico group of California or Vancouver Island.

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[1] Jahrbuch der k. k. geolog. Reichsanstadt, Wien, 1894, vol. xliv., pt. 3, p. 472.

IV.—*On some Fossils from the Nanaimo group of the Vancouver Cretaceous.*

By J. F. WHITEAVES.

(Read May 23, 1894, but revised to date.)

The present communication consists partly of notes upon some recently received fossil brachiopoda, mollusca and crustacea from the "Nanaimo group," with descriptions of a few species which appear to be new, and partly of a revision of the nomenclature of certain fossils from that formation which have previously been reported upon in the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada in 1879.

The new material upon which it is based is as follows: (1) The whole of the fossils from the "Nanaimo group" in the Provincial Museum at Victoria, kindly lent to the writer by its curator, Mr. John Fannin, and including a large series of fossils collected by Mr. Walter Harvey, of Comox, in 1892, at Hornby and Denman islands; (2) collections of Cretaceous fossils made by Dr. C. F. Newcombe on the Comox River, V. I., at Hornby Island in 1892, and at the Sucia Islands in 1894, and obligingly forwarded by him; and (3) a small series of Cretaceous fossils collected by Mr. Harvey at Hornby Island in 1894, which have been sent to the writer for identification. The new decapod crustacean which is described but not figured in this paper will probably be illustrated in the fourth and concluding part of the first volume of "Mesozoic Fossils," now in course of preparation.

MOLLUSCOIDEA.

BRACHIOPODA.

RHYNCHONELLA SUCIENSIS. (Sp. nov.)

Plate 3, fig. 1.

Shell moderately convex, subovate, with an apparently feebly developed mesial fold and sinus. Ventral valve a little longer than broad, with a narrow, elongated and nearly straight beak; dorsal valve broader than long, with a comparatively obtuse and incurved beak. Surface markings of both valves consisting of numerous (about twenty-two) narrow, prominent, acute raised ribs, which extend from the beaks to the anterior margin.

Sucia Islands, J. Richardson, 1874, one rather small but perfect specimen and two single valves; and Dr. C. F. Newcombe, 1894, six single valves.

MOLLUSCA.

PELECYPODA.

GRYPHÆA VESICULARIS, Lamarck.

Ostrea vesicularis, Lamarck. 1806. Ann. Mus., vol. viii., p. 160, pl. 22, fig. 3; and (1819) Hist. An. Sans Verteb., vol. vi., p. 219.

" " Goldfuss. 1826. Petref. Germ., vol. i., p. 23, pl. 81, fig. 2.

" " D'Orbigny, Pal. Franc., Terr. Crétac., vol. iii., p. 742, pl. 487, figs. 1 and 2, but not figs. 6, 8 and 9.

Ostrea convexa, Say. 1820. Am. Journ. Sc. and Arts, vol. ii., p. 42.

Gryphæa convexa, Morton. 1828. Journ. Ac. Nat. Sc. Philad., vol. vi., p. 79, pl. 4, figs. 1 and 2, and pl. 5, figs. 1-3; also (1834) Synops. Org. Rem. Cret. Gr. U. S., p. 53, pl. 4, figs. 1-2.

Gryphæa mutabilis, Morton. 1828. Journ. Ac. Nat. Sc. Philad., vol. vi., p. 81, pl. 4, fig. 3: and (1834) Synops. Org. Rem. Cret. Gr. U. S., p. 53, pl. 4, fig, 3.

Gryphæa vesicularis, Meek. 1876. Rep. U. S. Geol. Surv., Terr., vol. ix., p. 20 (which see, for several European and U. S. synonyms, not included in this list), pl. 11, figs, 2 *a*, *b*, c, and pl. 16, figs. 8, *a*-*b*.

Howe Sound, Mr. J. Fannin, 1884: one lower valve, about fifty-one millimetres long and fifty-seven broad. It is ovately subtriangular in outline, broader than long, and its posterior side is produced and somewhat pointed below. Nanaimo, V.I., two specimens; one a very gibbous lower valve, sixty-five mm. long and forty-two broad; the other, seventy millimetres in length by forty-nine in breadth, with both valves preserved *in situ*, but with a much less convex lower valve; both of them elongate subovate in marginal outline and almost equilateral. In two of the specimens the lower valve is strongly and regularly convex, but it is not lobed posteriorly by a distinct longitudinal groove or sinus on or near the front margin, in either of the three.

These free and narrowly convex shells look very different to the broad, irregularly subhemispherical specimens, with a broad surface of attachment to the umbo of the lower valve, from the Fort Pierre group of the Dakota Cretaceous, which Mr. Meek referred with some doubt to *O. vesicularis*. Still they correspond fairly well with Goldfuss' description and figures of the typical form of that species, which he calls the "var. *A*.," and describes as "*testa rostrata libera;*" also with Morton's figures of *G. convexa*, Say, and with one of Stoliczka's figures (Cret. Faun. S. India, pl. 42, fig. 4) of *O. vesicularis*.

INOCERAMUS DIGITATUS (Sowerby) Schmidt.

Inoceramus digitatus (Sowerby), Schmidt. 1873. Petref. Kreideform. Insel Sachalin, in Mem. Ac. Imp. des Sc. de St. Petersburg, vol. xix., no. 3, p. 25, pl. 5, figs. 10 and 11, and the whole of pls. 6 and 7.

Inoceramus undulatoplicatus (F. Roemer), Schluter. 1877. Kreide-Bivalven. Zur Gattung Inoceramus, p. 22, pl. 3, fig. 1.

" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, pl. 168, pl. 20, figs. 2 and 2*a*.

Inoceramus digitatus (Sowerby), Jimbo. 1894. Beitr. zur Kentniss der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæont. Abhandl. (Jena), Neue Folge, Band ii., heft 3, p. 43, pl. 8 (24), figs. 8-10.

The specimens of this species collected by Mr. Richardson on Vancouver Island in 1871 and 1872, and referred to in the second part of the first volume of the "Mesozoic Fossils," are nearly all of small size, though one individual, as there stated, is fully five inches and a-half in height. Some of them are higher than long, with a short hinge-line, and others longer than high, with a long hinge-line. Their sculpture also is equally variable, and consists either of continuous, concentric or radiating and divergent plications, or of corresponding rows of tubercles, in addition to the lines of growth.

In a paper on "Cretaceous Fossils from the Vancouver Island region,"[1] Dr. C. A. White doubts the correctness of the identification of the specimens collected by Mr. Richardson with *I. undulato-plicatus*, but they agree very well with Roemer's description, though perhaps not quite so well with his figure of that species.

However this may be, several small *Inocerami*, which are evidently conspecific with those collected by Mr. Richardson, were obtained by Dr. C. F. Newcombe in 1892 on the Comox River, V. I., and kindly presented by him to the Museum of the Geological Survey. With one exception, these specimens from Comox are all longer than high and have a long hinge-line. Their sculpture consists of concentric plications, which are rarely quite parallel with the closely and regularly disposed impressed lines of growth, upon the umbonal and central regions of each valve, and of radiating and divergent folds anteriorly.

The only specimen collected by Dr. Newcombe on the Comox River that is higher than long, with a short hinge-line, has very peculiar sculpture. In addition to the ordinary growth-lines, a nearly central and continuous longitudinal plication runs from the beak of the left valve (the only one preserved) to the base, a little in advance of the centre of the latter. On the anterior side, five simple plications radiate obliquely forward and outward from this subcentral fold, and on the posterior side four plications, three of which are simple and one bifurcating, radiate also obliquely forward and outward from it.

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[1] Bull. U. S. Geol. Surv., No. 51, pt. 3, p. 37.

In a letter received in August (1894) the writer was informed by Mr. T. W. Stanton (of the U. S. Geological Survey) that he had been recently studying a number of specimens of *Inocerami* with divergent radiating plications, from the Niobrara shales of Colorado, that he has no hesitation in referring to the *I. digitatus* of Sowerby, as re-defined and figured by Schmidt and Schluter, and that it seems to him quite likely that *I. undulato-plicatus*, Roemer, is only the young of that species. Schluter, in his paper on the Cretaceous *Inocerami*, is, indeed, inclined to keep these two forms separate, but Schmidt (*op. cit.*) regards both *I. undulato-plicatus*, Roemer, and *I. diversus*, Stoliczka, as mere synonyms of *I. digitatus*. Mr. Stanton adds, in effect, that although none of Schmidt's figures of *I. digitatus* exactly duplicate those of *I. undulato-plicatus* in the "Mesozoic Fossils," it still seems to him most likely that the Vancouver specimens are young individuals of *I. digitatus*, a conclusion in which the present writer entirely concurs.

NUCULA RICHARDSONII. (Sp. nov.)

Nucula pectinata, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 161, pl. 18, fig. 8, but not *N. pectinata*, Sowerby, 1818.

Shell similar to *N. pectinata*, but less inequilateral and much shorter in proportion to its height, the beaks being more nearly central, the posterior side longer and more obliquely truncated, the anterior shorter and more broadly rounded at its outer termination.

The slightly distorted left valve from the lower part of the Trent River, Vancouver Island, which was referred with doubt to the *N. pectinata* of Sowerby by the present writer in 1879, appears to be sufficiently distinct from that species to warrant the new specific name now proposed for it, in memory of its discoverer.

NUCULA HORNBYENSIS. (Nom. prov.)

Plate 3, fig. 2.

Perhaps a variety of *N. solitaria*, Gabb.

Cfr. *Nucula solitaria*, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 197, pl. 32, fig. 94.

Shell of medium size for the genus, compressed convex, subelliptical in marginal outline, rather oblique and very inequilateral. Anterior or longer side obliquely subtruncated at its extremity above and rather narrowly rounded below ; posterior or shorter side very regularly but narrowly rounded at the end ; ventral margin broadly rounded, but rather more convex posteriorly than anteriorly ; superior border nearly straight but slightly descending in front of the beaks, and sloping obliquely and much more rapidly downward behind them; beaks small, incurved and recurved, projecting very little above the highest level of the superior border, placed behind the midlength, and in one specimen almost terminal.

Surface almost smooth, marked only by a few faint concentric striæ of growth; test thin.

Dimensions of the largest specimen known to the writer: length, eleven millimetres; height, eight millimetres. The specimen figured is not quite six millimetres in length.

Northwest side of Hornby Island, in the "Middle Shales or Division D" of Mr. Richardson's Comox Section, W. Harvey, 1894: one right valve, one left valve, and a somewhat crushed specimen with both valves, each with the test preserved.

These specimens may represent a variety of *Nucula solitaria*, but if Mr. Gabb's figure of that species is correct it must have a very different marginal outline. His illustration represents a much more triangular shell than that of *N. Hornbyensis*, with a more prominent beak, and more pointed at both ends.

Nucula Traskana, Meek, from the Cretaceous rocks of Vancouver Island, was described from a single worn cast of the interior of the shell, which has never been figured and has since been lost. Mr. Meek states that the specimen was "probably provided with a distinct lunule," and that "the species will probably be recognized by its ventricose trigonal ovate form and nearly central beaks." This description is quite inapplicable to the specimens from Hornby Island, in which the lunule and escutcheon are both obsolete.

CLISOCOLUS DUBIUS, Gabb.

Loripes dubius, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 177, pl. 24, figs. 170 and 171.
Clisocolus dubius, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 189, pl. 30, fig. 7.
Lucina Richardsonii, Whiteaves. 1874. Geol. Surv. Canada, Rep. Progr. for 1873-1874, p. 266, pl. of foss., fig. 1.
Thetiopsis circularis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i, pt. 2, p. 153.
Clisocolus dubius, White. 1889. Bull. U. S. Geol. Survey, no. 51, p. 41, pl. 6, figs. 5-7.

The specimens from Vancouver, Hornby and the Sucia islands, which the writer first described as *Lucina Richardsonii*, and afterwards referred to the *Thetis circularis* of Meek and Hayden, the type of Meek's suggested genus *Thetiopsis*, are obviously identical with the *Clisocolus dubius* as since figured by Dr. C. A. White, and with specimens from the Chico group of Shasta County, California, labelled *C. dubius*, and kindly loaned by Mr. Stanton. It still, however, appears to the writer that the specimens collected by Mr. Richardson are much more like the *Thetis circularis*, as figured by Meek and by Whitfield, than they are to Gabb's illustrations of *C. dubius*.

CLISOCOLUS CORDATUS, Whiteaves.

Clisocolus cordatus, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., p. 157, pl. 18, figs. 3, 3 *a-b*, but probably not *Cyprina cordata* of Meek and Hayden (1857) nor *Clisocolus dubius*, Gabb.

" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 41, pl. 6, figs. 8 and 9.

The identification of the Sucia Islands specimens collected by Mr. Richardson with the species from the Fox Hills group of Dakota, which was first described by Meek and Hayden as *Cyprina cordata* and subsequently by Meek as *Sphæriola cordata*, has not proved satisfactory, and they seem to be quite distinct from Gabb's *Clisocolus dubius*.

CYTHEREA NITIDA, Gabb. (Sp.)

Cytherea Leonensis, Etheridge. 1861. Quart. Journ. Geol. Soc. Lond., vol. xvii., p. 432, but not *C. Leonensis*, Conrad, 1857.

Cytherea Conensis (err. typ. for *Leonensis*), Etheridge. 1863. The No. 42 of the list of specimens on page 243 of Capt. Palliser's official report.

Venus (Mercenaria ?) varians, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 161, pl. 23, figs. 140 and 141.

Meretrix nitida, Gabb. 1864. *Ib.*, p. 165, pl. 23, figs. 145 and 146.

Chione varians, Gabb. 1869. Geol. Surv. Calif., Palæont., vol. ii., p. 239.

Caryatis nitida, Gabb. 1869. *Ib.*, p. 240.

Cytherea (Caryatis) plana, Whiteaves. 1879, Geol. Surv. Canada, Mes vol. i., pt. 2, pl. 17, figs. 14, 14 *a-b*; but probably not "*Venus planus*," Sby., nor *Aphrodina Tippana*, Conrad.

The writer has long been convinced that the specimens from Hornby, Vancouver and the Sucia islands, which he identified with the "*Venus planus*" of Sowerby, in 1879, are not that species, but the *Caryatis nitida* of Gabb. In December, 1892, Mr. Stanton examined these specimens while on a visit to Ottawa, and expressed the opinion that they could not be distinguished from *Chione varians*, Gabb. Since then Mr. Stanton has forwarded a series of each of these nominal species from the Chico group of California, and both he and the writer have quite independently come to the conclusion that the characters which Mr. Gabb relied upon to distinguish his *Caryatis nitida* from *Chione varians* are neither constant nor sufficient to justify their separation.

CYTHEREA ARATA, Gabb.

Meretrix arata, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 166, pl. 30, fig. 250.
" " Gabb. 1869. *Ib.*, vol. ii., p. 240.
Cytherea (Callista) laciniata, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 148, pl. 17, figs. 13 and 13*a*, and pl. 19, figs. 4 and 4*a*, but perhaps not *Cytherea (Callista) laciniata*, Stoliczka, 1871.

The specimens referred to *Cytherea* (*Callista*) *laciniata*, Stoliczka, in the "Mesozoic Fossils" (*op. cit.*, p. 148) have recently been found to be exactly similar to a specimen from the Chico group of Tehama County, California, which Mr. Stanton has identified with *Meretrix arata*, Gabb, and kindly loaned to the writer. The original description of the sculpture of *M. arata* is rather misleading. According to Mr. Gabb, its surface is "ornamented by regular, concentric, acute impressed lines," whereas, in the writer's judgment, it would be much more correct to say by small, concentric, rounded ribs, with very narrow furrows between them.

CYPRIMERIA LENS, Whiteaves.

Cyprimeria lens, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 152, pl. 17, figs. 15 and 15*a*, but not *Meretrix lens*, Gabb, 1864, which is probably not a *Cyprimeria*.
" " White. 1889. Bull. U. S. Geol. Surv., no. 51, p. 42.

Shell compressed convex, moderately inflated, ovately subcircular in marginal outline, and nearly as high as long; posterior side a little longer, and in some specimens rather more narrowly rounded than the anterior; basal margin broadly convex; superior border descending rapidly and obliquely in front of the beaks, gently convex and slightly prominent immediately behind them, thence curving gradually downward to the posterior end; beaks placed a little in advance of the mid-length, small, depressed, appressed and curved forward. No definite nor distinctly-margined lunule, and apparently no well-defined escutcheon.

Test rather thick, its surface polished and marked with numerous very fine and closely disposed concentric striæ, also with four or five distant and coarser linear concentric grooves or periodic arrests of growth.

Hinge with two cardinal teeth and one lateral tooth in the left valve. The two cardinal teeth are transverse and divergent, the anterior one being thick and excavated in the middle, but not bifid. The lateral tooth, which is thin and feebly developed, is partially separated from the cardinal fulcrum by a narrow, shallow groove. Anterior muscular impression large and subovate; posterior muscular scar, pallial line and hinge dentition of the right valve unknown.

Northwest side of Hornby Island, J. Richardson, 1872: one left valve. Sucia Islands, J. Richardson, 1874; three imperfect right valves and one left valve, the latter showing the hinge dentition of that valve; and Dr. C. F. Newcombe, 1894: one large and perfect left valve.

These are most probably not identical with the *Meretrix lens* of Gabb, as the writer once supposed they were. The specimen from Hornby Island is a little more pointed posteriorly than those from the Sucia Islands, but this feature is rather exaggerated in the unsatisfactory figure of this specimen, on Plate 17 of the "Mesozoic Fossils." The specimens from the Sucia Islands have more the general contour of a *Dosinia* than of a *Meretrix* (or *Cytherea*, as that genus is more frequently called), and their hinge dentition is that of *Cyprimeria.* In the original description of *Meretrix lens* nothing is said, and nothing appears to be known, about the hinge dentition or other characters of the interior of the shell, but there are at present no valid reasons known to the writer for doubting the correctness of its reference to the genus *Cytherea* or *Meretrix.*

Mr. Stanton, who has kindly compared the Sucia Islands specimens with Meek's types of *Cyprimeria* (?) *tenuis*, from Vancouver and Newcastle islands, thinks that the latter species (whose internal characters are still unknown) is much more compressed and has a different outline.

TELLINA OCCIDENTALIS, Whiteaves.

Tellina (Peronæa) occidentalis, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 144, pl. 17, figs. 11 and 11 *a*; but not *Tellina occidentalis*, Morton, 1842, which is a *Lucina;* nor *Thracia (?) occidentalis*, Meek, 1857.

The specimens from Gabriola Island and the Nanaimo River, which the writer formerly supposed to be referable to *Thracia occidentalis*, Meek, prove to be distinct from that shell, which Mr. Stanton states has a "pearly lustre and other characters of the *Anatinidæ.*"

GASTEROPODA.

EUNEMA CRETACEUM. (Sp. nov.)

Plate 3, fig. 3.

Shell small, imperforate, apparently elongate turbinate, with the spire about equal in height to the outer volution, as viewed dorsally, though the few specimens collected so far are so crushed that their exact original shape is uncertain. Volutions five or six, those of the spire step-shaped or shouldered, but flattened somewhat obliquely next to the shoulder above, the outer volution rounded and moderately ventricose below the shoulder; suture distinct and angular.

Surface marked with narrow but comparatively distant spiral ridges, which are crossed by very numerous, close set and regularly arranged, acute, longitudinal, thread-like raised lines. On the dorsal portion of the last volution of the spire there are three of these spiral ridges, and upon that of the outer volution about seven. Test thin, its inner layer distinctly nacreous.

The exact dimensions cannot be given. but an average specimen is estimated to have been eleven millimetres and a-half in length and nine in maximum breadth, when perfect.

Northwest side of Hornby Island, W. Harvey, 1894: four or five crushed specimens.

This interesting little shell is referred to the genus *Eunema* mainly on the authority of Zittel,[1] who states that *Amberleya*, Morris and Lycett, and *Eucyclus*, Deslongchamps. are synonymous with it, and that it ranges in time from the "Lower Silurian" into the Cretaceous.

NERINÆA DISPAR? Gabb. (Var.)

Plate 3, fig. 4.

Cfr. *Nerinæa dispar*, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 113, pl. 19, figs. 66 and 66 *a*.

Shell essentially similar in shape and surface markings to *N. dispar*, but smaller, and devoid of the rounded spiral fold at the base of each volution said to be characteristic of that species, also with the longitudinal ribs apparently obsolete on the lower volutions.

Hornby Island, W. Harvey, 1894: three specimens. The most perfect of these has seven volutions preserved, with the minute details of the sculpture of each quite clearly shown. The three upper volutions are marked with small longitudinal ribs which cross the volutions transversely, but on the three lower volutions these ribs appear to be absent, though their absence may be due to the exfoliation of part of the outer layer of the shell.

TESSAROLAX DISTORTA, Gabb.

Tessarolax distorta, Gabb. 1864. Geol. Surv. Calif., Palæont.. vol. i., p. 126, pl. 20, figs. 82 and 82, *a-b*.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 123.

Northwest side of Hornby Island, in the "Middle Shales or Division D" of Mr. Richardson's Comox section, W. Harvey, 1894: nine specimens, most of them preserved in a very brittle shale.

CYPRÆA SUCIENSIS. (Nom. prov.)

Plate 3, fig. 5.

Shell small, moderately inflated, narrowly subovate and a little more than half as broad as long, emarginate at both ends, but much more deeply so posteriorly than anteriorly. Spire entirely covered when the outer coating of enamel is perfect, but in the only specimen collected the enamel is partially exfoliated in such a way as to show that underneath it the spire is very small, conical, and composed of at least four volutions, also that it extends just as far backward as the produced posterior end of the outer lip. This partial exfoliation of the outer layer of enamel is, however, barely perceptible to the naked eye, and is not shown in the figure. Outer volution very large in proportion to the rest, broadest and most inflated a little behind the mid-length, abruptly attenuate behind, but narrowing much more gradually in front, its anterior margin being narrowly rounded; outer lip thickened exteriorly and considerably produced behind; inner or columellar lip also produced behind and separated from the outer lip by a narrow channel or canal; characters of the interior of the aperture unknown, though it clearly extended the whole length, and is narrow and linear behind.

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[1] Handbuch der Palæontologie, vol. ii., 1884, p. 189.

Surface smooth.

Dimensions of the specimen described (which has been kindly presented by its discoverer to the Museum of the Geological Survey); length, twenty millimetres; greatest breadth, twelve millimetres.

Sucia Islands, Dr. C. F. Newcombe, 1894.

Most of the aperture of this interesting little fossil is filled with the tough and tenacious matrix, so that it is impossible to ascertain whether there are or are not any crenulations on the inner surface of the outer lip, or any denticulations or plications on the columellar side. The external characters of the specimen, however, would seem to show that it is a small smooth *Cypræa*, very closely allied to the *C. Cunliffei* of Forbes,[1] from the Arrialoor group of the Trinchinopoly district of Southern India, and it may prove to be only a variety of that species. The *Cypræa Bayerquei* and *C. Mathewsoni*, described in the first and second volumes of the Palæontology of California as from the Tejon group of that state, are now generally regarded as Eocene fossils.

CEPHALOPODA.

PHYLLOCERAS VELLEDÆ, (Michelin) D'Orbigny.

Ammonites Velledæ (Michelin), D'Orbigny. 1840. Pal. Franc., Terr. Cret., vol. i. p. 280, atlas, pl. 82; also of Pictet and Campiche, and Stoliczka.

Ammonites (Scaphites?) ramosus, Meek. (1857.) Trans. Albany Institute, vol. iv., p. 45.

Phylloceras ramosus, Meek. 1876. Bull. Geol. and Geogr. Surv. Terr., vol. ii., no. 4, p. 371, pl. 5, figs. 1, 1, *a-b*.

Ammonites Velledæ, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 103.

Northwest side of Hornby Island, W. Harvey, 1892: two fine speci-

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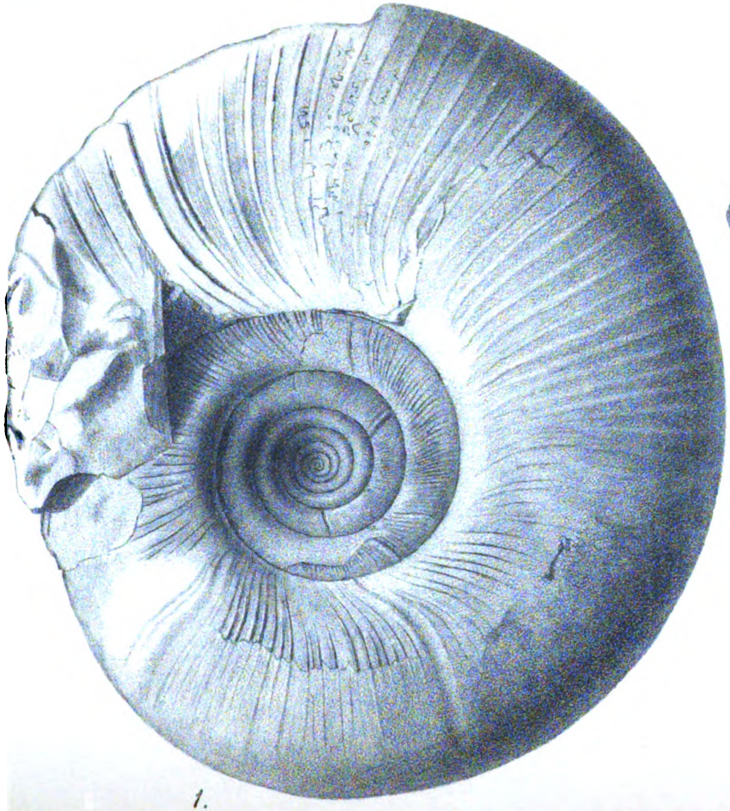
[1] Trans. Geol. Soc. Lond., vol. vii. (1846), p. 134, pl. 12, fig. 22; and Stoliczka (1868), Cret. Foss. S. India, vol. ii., p. 55, pl. 4. fig. 4.

Trans. R S. C., 1895. Sec. IV., Plate II.

VANCOUVER CRETACEOUS FOSSILS.



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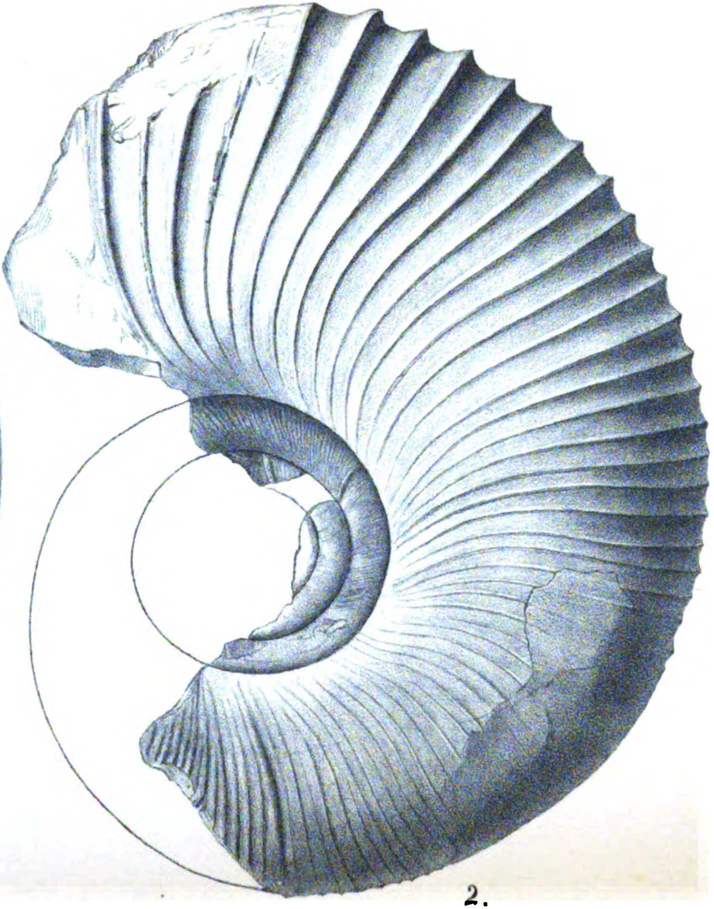


2.

To Illustrate Mr. Whiteaves's Paper.

L. M. LAMBE, F.G.S., DEL. O. E. PRUD'HOMME, LITH.

mens. The smaller of these, which is now in the Museum of the Geological Survey, is seventy-four millimetres, or nearly three inches, in its greatest diameter.

PHYLLOCERAS INDRA. (Var.)

Ammonites Indra, Forbes. 1846. Trans. Geol. Soc. Lond., vol. vii., p. 105, pl. 11, fig. 7.
" " Stoliczka. 1865. Cret. Cephalop. S. India, vol. i., p. 112, pl. 58, fig. 12.
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. 1., pt. 2, p. 105, pl. 13, figs. 2 and 2 *a*.

Northwest side of Hornby Island, W. Harvey, 1892: a single specimen, about four inches and a-half in its maximum diameter, which is apparently referable to this species. Its volutions, however, are more nearly circular than those of the type of *Ammonites Indra*, as described and figured by Stoliczka, and than those of the specimen from Hornby Island collected by Mr. Richardson in 1871. Its surface, also, is marked by numerous but very faint and almost obsolete spiral ribs, in addition to the usual and equally faint curved transverse furrows and fine lines of growth.

LYTOCERAS JUKESII, Sharpe.

Plate 2, figs. 1 and 2.

Ammonites Jukesii, Sharpe. 1853. Descr. Foss. Rem. Mollusc. found in Chalk of England, p. 53, pl. 23, figs 11, *a-e*.
" " Pictet and Campiche. 1858-60. Pal. Suisse, Foss. St. Croix, pt. i., p. 350.
" " Whiteaves. 1876. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 111, pl. 13, figs. 3, 3, *a-b*.

Middle of east side of Denman Island, W. Harvey, 1892: four fine specimens, one a little less and three a little more than four inches in their maximum diameter.

The specimen from Norris Rock, south of Hornby Island, which was referred to this species, though with some doubt, in the second part of the first volume of "Mesozoic Fossils," is a fragment of the inner whorls, a little more than two inches in diameter, which has been described in detail and figured. Three of the specimens from Denman Island have at least seven of the volutions preserved, and all four are referred with some confidence to *A. Jukesii*, which proves to be a *Lytoceras*, as suspected in 1879. In one of these specimens (figure 2) the sculpture of the test is beautifully preserved on the outer volution. It consists of very narrow, sharp and prominent simple transverse ribs, which curve convexly forward next to the umbilical margin, but are nearly straight on the sides and periphery. At the commencement of the volution these ribs are two millimetres apart on and near the periphery, but the flat, smooth intervals between them gradually become wider and wider, until at last the ribs in the same region, near the aperture, are as much as seven millimetres apart.

A characteristic fragment of this species was collected by Mr. Harvey in 1892, on the northwest side of Hornby Island.

ANISOCERAS VANCOUVERENSE, Gabb. (Sp.)

Hamites Vancouverensis, Gabb. 1864. Geol. Surv. Calif., Palæont., vol. i., p. 70, pl. 13, fig. 18.

Northwest side of Hornby Island, W. Harvey, 1893 : one good specimen, upwards of five inches in length and four in its greatest breadth, which is now in the possession of the Provincial Museum at Victoria, B.C. The maximum diameter of the shelly tube of which it is composed is forty-five millimetres. The "prolonged portion," as Stoliczka calls it, is much longer than the "reflected portion," and the former is slightly incurved posteriorly.

A much more perfect specimen, which measures nearly eight inches in its maximum length, and which has been described and figured in the "Canadian Record of Science" for April, 1895, has been collected quite recently by Mr. Harvey at Hornby Island. This specimen shows that the earlier portion of the shell in this species is narrowly elongated, sinuous, spirally twisted and curved obliquely outward, as in *Anisoceras*, before becoming straight and prolonged, and that it does not consist of a slender shelly tube bent twice or more upon itself, as in *Hamites*.

HAMITES OBSTRICTUS, Jimbo.

Hamites cylindraceus, Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 113, pl. 14, figs. 2 and 2 *a*, but not *H. cylindraceus* of Defrance or D'Orbigny.

Hamites obstrictus, Jimbo. 1894. Beitr. zur Kennt. der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæontol. Abhandl., n. ser., vol. vi., p. 38, pl. 7 (23). figs. 2, 2, *a-b*.

Posterior extremity of the shell unknown, the prolonged and reflected portions slender, straight, almost circular in outline in transverse section, unless when abnormally compressed, and separated from each other by a space about equal in width to the maximum diameter of the reflected portion, near the aperture.

Surface marked by prominent, narrow, simple and rarely bifurcating transverse ribs, which are rounded at their summits and separated by rather deep concave furrows. Besides the ribs, or rather furrows, there is a single transverse constriction on the reflected portion of the shell. On the prolonged portion the ribs are about one millimetre apart, but on the reflected portion they are nearly two millimetres apart.

Sutural line as represented on plate 14, figure 2*a*, of the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada.

Sucia Islands, J. Richardson, 1874: one crushed specimen, with the sutural line well preserved. Northwest side of Hornby Island, W. Harvey, 1893: two good specimens, one of them apparently free from distortion. All three, upon the whole, agree remarkably well with Jimbo's description and figures of *H. obstrictus*, although in that species there are two transverse constrictions of the prolonged portion of the shell, as well as one on the reflected portion, and the lobes and saddles of its sutural line are perhaps not quite so numerously incised as those of the specimen from the Sucia Islands.

DESMOCERAS GARDENI, Baily.

Ammonites Gardeni, Baily. 1855. Quart. Journ. Geol. Soc. Lond., vol. ii., p. 456, pl. 11, fig. 3.
" " Stoliczka. 1865. Cret. Ceph. S. India, vol. i., p. 61, pl. 33, fig. 4,
" " Whiteaves. 1879. Geol. Surv. Canada, Mesoz. Foss., vol. i., pt. 2, p. 102.
Desmoceras Gardeni, (Baily), Zittel. 1884. Handbuch der Palæont., vol. ii., p. 466.
Puzozia Gardeni, Kossmat. 1894. Jahrbuch der k. k. geolog. Reichsanstalt, vol. xliv., p, 472.

Comox River, V. I., Dr. C. F. Newcombe, 1892: two specimens.

PACHYDISCUS OOTACODENSIS, Stoliczka. (Sp.)

Ammonites Ootacodensis, Stoliczka. 1865. Cret. Cephal. S. India, p. 109, pl. 54, figs. 3 and 4, and plates 56 and 57.
Pachydiscus Ootacodensis, Kossmat. 1894. Jahrbuch der k. k. geolog. Reichsanstalt, vol. xliv., p. 472.

In the paper last quoted a fine specimen of this species is stated to have been recognized by Dr. Kossmat in a part of Sir James Hector's collection from Nanaimo, now in the British Museum (Natural History) at South Kensington. It is difficult, however, to see how the Ammonite from Vancouver Island, which Mr. Gabb figures on Plate 27 of the first volume of the Palæontology of California as *A. Newberryanus*, can be distinguished from *Pachydiscus Ootacodensis* on the one hand, or from *P. Suciensis* (the *Ammonites complexus*, var. *Suciensis*, of Meek) on the other. This *Ammonite* has long been known to be quite distinct from *Ammonites Newberryanus*, Meek. An essentially similar specimen, which may therefore be referable to *P. Ootacodensis*, was collected by Mr. Richardson in 1873 at Northwest Bay, Vancouver Island. It is the specimen referred to as No. 2 on page 109 of the second part of the first volume of "Mesozoic Fossils," published by the Geological Survey of Canada, under the heading *Ammonites complexus*, var. *Suciensis*.

PACHYDISCUS HARADAI, Jimbo.

Plate 3, fig. 6.

Pachydiscus Haradai, Jimbo. 1894. Beitr. zur kenntniss der Fauna der Kreideform. von Hokkaido, in Dames and Kayser's Palæont. Abhandl., n. s., vol. vi., p. 29, pl. 2 (18), figs. 2, 2, *a-b*.
Cfr. also *Ammonites Egertonianus* (Forbes), Stoliczka. 1865. Cret. Cephal. S. India, p. 104, pl. 53, figs. 1-4.

Nanaimo River, ten miles from its mouth, A. Raper, May, 1893: a fine specimen about six inches in its maximum diameter, which agrees remarkably well with Jimbo's description and figures of *P. Haradai*. It differs, however, very little from the type of *Ammonites Egertonianus*, Forbes, as figured by Stoliczka, or from *Pachydiscus Suciensis*. Its volutions are compressed at the sides, the periphery is regularly rounded, and the umbilicus occupies rather less than one-third of the entire diameter. There are eleven large, continuous and distant simple ribs on the outer volution, with from one to four rather smaller and shorter ribs between them, and the intervals between all of them are finely and transversely striated.

BELEMNITES. (Species undeterminable.)

Beach at Hornby Island, W. Harvey, 1892: a slender phragmocone, forty millimetres long and seven millimetres broad at the larger end. The chambers are very numerous and the siphuncle is marginal.

CRUSTACEA.

DECAPODA.

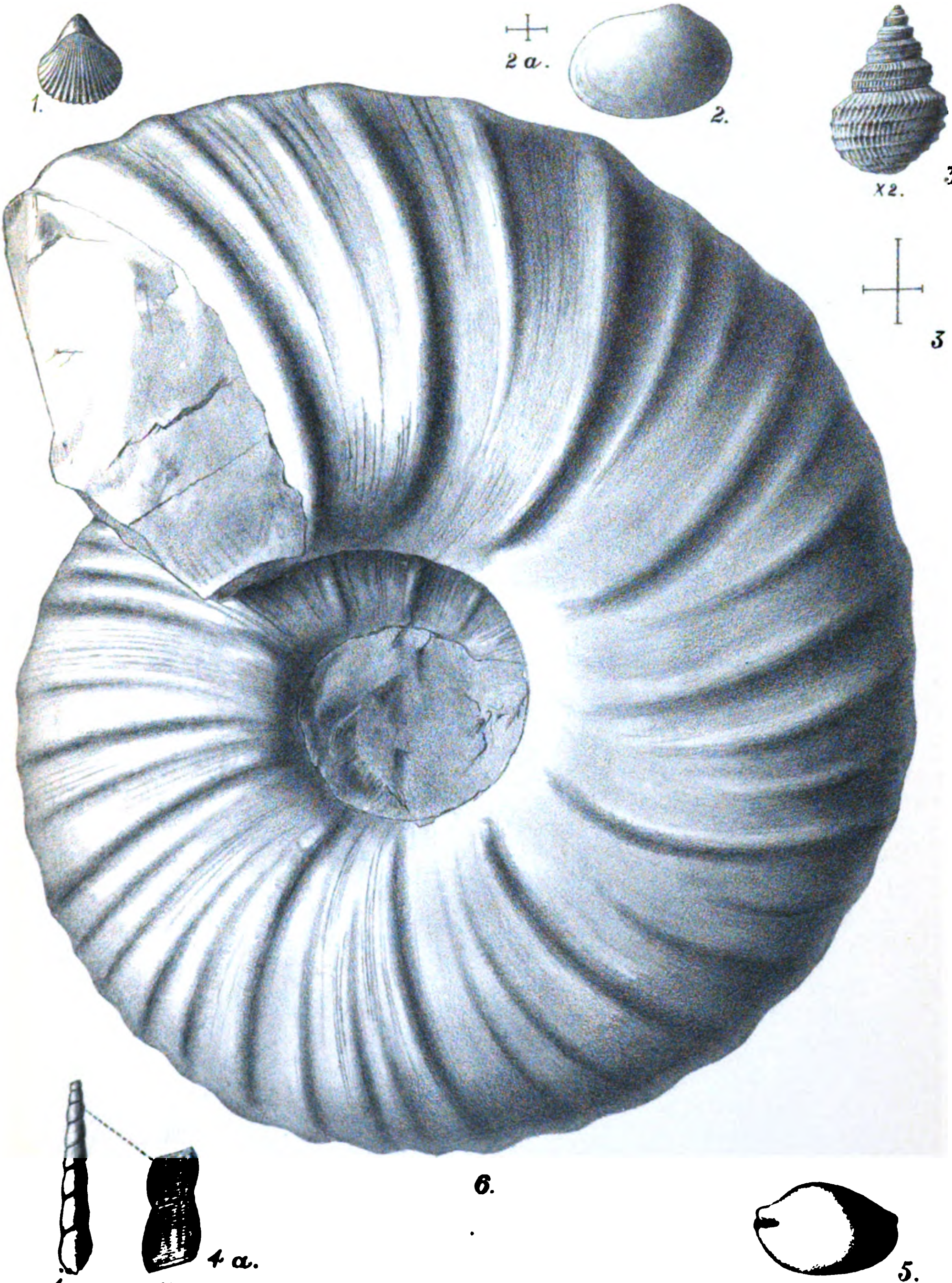
PODOCRATES VANCOUVERENSIS. (Sp. nov.)

Carapace flattened, rectangular, longer than broad, marked by three low angular tuberculose, or spinose longitudinal ridges, one in the median line, and one near each of the lateral margins, and divided at about one-third the distance from the front by an obtusely subangular cervical groove, which is rather broad but not very deep. On the anterior portion, or cephalic arch, the lateral longitudinal ridges are well developed, and armed with larger and more spinose tubercles than those on the corresponding ridges of the posterior portion, one a little behind the mid-length on each ridge being larger than any of the others, but the central ridge is obsolete. In its place, just in advance of the cervical groove, there is an ovate lanceolate or narrowly spear-shaped area, which is elevated at the pointed end anteriorly, shallowly depressed posteriorly, and margined with a single row of small tubercles. Immediately in front of this area there is a pointed or spinose tubercle, almost in a line with

VANCOUVER CRETACEOUS FOSSILS.

Trans. R. S. C., 1895.

Sec. IV., Plate III.



To Illustrate Mr. Whiteaves's Paper.

L. M. LAMBE, F.G.S., DEL.
O. E. PRUD'HOMME, LITH

the largest tubercle on each of the lateral ridges, and still farther forward there are two similar tubercles at a short distance from the anterior margin and about seven millimetres apart. On the posterior portion, or scapular arch, the three longitudinal ridges are minutely tuberculated, and extend from the posterior margin to the cervical groove, where they each terminate in a pointed tubercle larger than any of the rest, but the central ridge is shorter than either of the two lateral ridges. Antero-lateral angles of the carapace each armed with a nearly straight but slightly divergent spine. Rostrum, central portion of the anterior margin and position of the eyes unknown. External antennæ broad and flattened at their bases, inner antennæ cylindrical at theirs.

Walking feet slender, as is usual in the genus.

In addition to the spines and tubercles on the lateral ridges and elsewhere, as already described, the whole of the upper surface of the carapace is minutely granulose and apparently setose, the perforations at the summits of each of the granules and numbers of minute objects, which seem to be detached setæ, being plainly visible under an ordinary lens.

Two miles up the Puntledge River, Vancouver Island, Rev. G. W. Taylor, 1889: a good specimen of the carapace, with the rostrum and a small piece of the anterior portion broken off, but with considerable portions of the ambulatory feet and the bases of the inner and outer antennæ preserved. This interesting fossil is now in the Museum of the Geological Survey of Canada.

Hornby Island, W. Harvey, 1893: a less perfectly preserved specimen, showing most of the carapace (but not the rostrum), portions of the ambulatory feet, and the dorsal aspect of four segments of the abdomen, though it is uncertain whether their margins were denticulated or not.

In the second volume of Transactions of this Society the writer described a long-tailed decapod crustacean from the Cretaceous rocks at the Highwood River in Alberta, under the provisional name *Hoploparia* (?) *Canadensis*. Dr. C. Schluter, of Bonn, Germany, in a letter dated February 20, 1890, expresses the opinion, which appears to be well founded, that this species, which is figured on plate 11 of the first part of the first volume of "Contributions to Canadian Palæontology," is a *Podocrates*, closely allied to, if not identical with, the *P. Dülmensis* of Becks. *Podocrates Canadensis*, as it should now be called, may prove to be only a local variety of *P. Dülmensis*, but *P. Vancouverensis* seems to differ from that species in the much smaller proportionate size of the tubercles on the three longitudinal ridges on its carapace, especially posteriorly, and in the different arrangement of the distant spinose tubercles on the anterior moiety of its cephalic arch.

V.—*Note on the occurrence of Primnoa reseda on the coast of British Columbia.*

By J. F. WHITEAVES.

(Read May 16, 1895.)

P. reseda is a large, branching or tree-like Alcyonarian coral, that, as shown by Professor Verrill,[1] was first described by the Russian naturalist Pallas, in his "Elenchus Zoophytarum," published in 1766, as *Gorgonia reseda,* and subsequently by Linnæus, in the twelfth edition of the "Systema Naturæ," published in 1767, as *Gorgonia lepadifera.*

The genus *Primnoa* was constituted for its reception by Lamoroux in 1816, and it was made the type of a distinct family, the Primnoadæ, by Dr. J. E. Gray in 1859. In the report on the Alcyonaria collected by H.M.S. "Challenger," by Professors Wright and Studer, published in 1889, *P. reseda* is included in the family *Primnoadæ,* of section 2 of the order *Gorgonacea* of Verrill. This order is there defined as consisting of "fixed colonial Alcyonaria with a more or less firm internal axis, which is covered by a cœnenchyma from which the polyps, with their short body cavities, arise." Section 2 of that order, for which the term *Holaxonia* is proposed, is described as including seven families of "Gorgonacea with an axis which consists of horny material, or of a calcified horny substance, or of alternating joints of amorphous calcareous material and horn." The family *Primnoadæ* is re-defined as follows: "Holaxonia with a calcareous and horny axis, basal attachment always calcareous. The polyps with a projecting, usually club-shaped calycine portion, tentacular portion retractile. The cœnenchyma contains a superficial layer of scale-like calcareous bodies, which are continued upwards over the calyx, where they are arranged in regular sequence, usually bilaterally symmetrical, they overlap each other around the margin of the calyx; eight of the scales form an operculum, and they may be brought together so as to close the opening. The calyces are movable; they are thrust outward when erect, or are, when retracted, turned towards the stem, so as to lay their oral apertures against the stem. In some species this retraction is also accompanied by a twisting of the base of the calyx, which turns the oral aperture downwards." The amended definition of the genus *Primnoa,* in this report, is as follows: "The colony is branched. The polyps occur in close spirals over the entire periphery of the stem and branches. Each polyp calyx is inclosed dorsally and laterally by two large scales, of which there are two longitudinally overlapping rows, the upper margin of one scale always overlapping the lower border of the next. There is a ventral space destitute of scales, except at the calyx margin, where four are present, forming with the two pairs of dorso-lateral scales an operculum. The calyces can be turned downwards from the stem."

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[1] In Bull. Mus. Comp. Zool., Cambridge, Mass., vol. 1 (1864), p. 37, and in subsequent papers.

Professors Wright and Studer state that the type species of this genus, *Primnoa reseda*, L., "seems limited to the Atlantic Ocean, where it is found from the Cape de Verdes to tho Polar Sea ; it has been dredged in deep water off Setubal, at St. George's Banks, and in the Bay of Fundy."

In the spring of 1894, however, Mr. Otto J. Klotz, D.T.S., of this city, obtained a fine specimen of an Alcyonarian, which Professor Verrill has identified with this species, on the coast of British Columbia. This specimen, which Mr. Klotz has kindly presented to the Museum of the Geological Survey, is stated by him to have been hooked by an Indian in the fall of 1893, while halibut fishing in Work Canal, near Port Simpson, in about twelve fathoms of water. Its colour, when fresh out of the water, is said to have been bright red, but when it came into Mr. Klotz's hands it was creamy pink. It is upwards of three feet in height and a little more than two feet in the maximum spread of its branches.

A characteristic fragment of another specimen of *P. reseda*, which is stated to have been collected on the north coast of the Queen Charlotte Islands, has recently been presented to the Museum of the Survey by W. B. Anderson, of Comox, V.I., through Professor Macoun. It would appear, therefore, that this long known and interesting species is not uncommon in the northern part of the Pacific Ocean. Three large Alcyonarians are now known to occur on the coast of British Columbia, viz., *Verrillia Blakei*, Stearns, *Paragorgia Pacifica*, Verrill, and *Primnoa reseda*, Pallas, sp. Fine examples of each of these are in the Museum of the Geological Survey of Canada.

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